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Abstract

Motion planning for a fixed-wing UAV is a complex task, especially due to the dynamic constraints of the aircraft. The work presented here is based on a two-stage planning framework. The global planning stage consists of a probabilistic roadmap planner which computes a sequence of waypoints accounting for kinematic constraints. Those are fed into a deterministic tree-based local planner that locally refines the path using closed-loop dynamics motion primitives. In this paper we focus on the local planner which we present in detail. Tree expansion is guided by a metric based on Dubins curves. We provide simulation results comparing the metric to three alternative metrics to support our choice. The computational complexity is reduced by limiting the set of motion primitives depending on the environment. Furthermore, we redefine the waypoint proximity criterion by considering the Dubins metric. We discuss the suggested planner and thoroughly analyze its possible failure modes. The simulations are concluded by showing the efficiency of the local obstacle avoidance strategy using just the local planner and together with the global planner in a complex urban scenario. The simulation reveals promising behavior for both the local planner and the coupled planners.